

**SECTION VIII**

**SESSION 5: FUTURE DIRECTIONS AND THE  
MIL-PRIME-STD**

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## AERONAUTICAL PROCUREMENT - THE PRIMARY SPECIFICATION SYSTEM

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### Abstract

The Aeronautical System Division has developed a new system of writing and using specifications for the Procurement of Aeronautical Equipment. This new system requires the statement of requirements in terms of operational needs with values left blank. The values are filled in for each program. In addition, a handbook will be provided for each specification that provides rationale for requirements, guidance for use of the specification and will act as a depository for lessons learned. These documents will be written to cover board product families.

The paper will also address the relation of this new system to Office of Management & Budget circular A-109 which requires mission needs rather than technical requirements.

### I. Introduction

In April 1976 the Office of Management and Budget issued circular A-109. This document will have a profound effect on the way we budget and procure systems in the future. During this same time frame the Air Force's Aeronautical Systems Division undertook a new program to upgrade its methods of writing and using specifications and standards. Together these changes are going to have an effect on procurement of Aeronautical Systems and the Aerospace community. This paragraph briefly addresses circular A-109 and provides details on primary specifications.

### II. Circular A-109

The Congressional Budget Act of 1974 (Public Law 93-344) establishes reforms in the overall budget and procurement cycle and becomes effective with the FY 1979 budget. The circular basically requires that a request for funds should be based on a mission need rather than a specific hardware item. This was established to encourage innovation and competition in creating, exploring, and developing alternative system design concepts. Figure 1 illustrates the difference between the current and the A-109 (mission) approach. Figure 2 views a typical Air Force Request, but rather than specifying a solution, we now accept a variety of approaches and select the best one. The circular specifically states that a "need should not be defined in equipment terms, but should be defined in terms of the mission, purpose, capability, agency components involved, schedule and cost objectives, and operating constraints."

This new policy results in a conflict with usage of current specifications. The specifications of today are, in themselves, not bad documents as many have claimed, but rather are misapplied. In reality, today's specifications are written to procure a specific product. Over the years the philosophy of the detail specification has spread into research and development procurements. The detail specification in the R&D environment is one of the largest contributors of problems within the system yet in most cases it is not recognized. Recent efforts have recognized this and led to efforts to correct the problems.

In essence most of the problems associated with these documents was the application of the specification and standards. The Defense Science Board Task Force reviewing this area initial findings were reported by Deputy Secretary Clements to the Military Department Secretaries: "The Task Force has concluded the content of specifications and standards is not the primary contributor to unnecessary contract costs although there is a continuing need for evolutionary improvement. The main cause of cost escalation was identified to be in the application, interpretation, demonstration of compliance and enforcement of specifications and standards in RFPs (sic: Request for Proposals) and contracts. This, therefore, is a fertile area for effective cost reductions in the acquisition process." Deputy Secretary Clements directed the Department Secretaries to "Institute Procedures and Policies to control blanket contractual imposition of such specifications and standards. These controls should be structured to force technical activities to tailor requirements to the essential specific operational needs of the end item or system." (Underlines added) The overall theme is to force tailoring and state requirements in terms of operational needs.

The Task Force recommended two steps in its April 1977 final report; an evolutionary program to improve existing specifications, and an immediate program throughout the services and industry to improve the climate of applying the specifications.

### III. The Primary System

In January 1976, the Aeronautical Systems Division started an effort to review its own utilization and development of military specifications and standards. At the time, there was no attempt to marry the specification system and A-109 budget system. What has evolved, however, is a systems approach to specifications in the R&D cycle that fits the objectives of A-109 and meets the long range recommendation of the Defense Science Board. While the A-109 looks toward mission approach, these specifications view mission needs and at the same time have evolved into a new document that forces tailoring. It is interesting to note in the experimental usage of this new system the tailoring philosophy has carried over from specifications into other items such as data items and management plans.

The ASD approach was to develop a specification system that viewed both the development and reprocurement cycles of the specifications.

The essential objectives of the ASD program are:

- a. Have a structure which will facilitate and "force" selective application (tailoring).
- b. Insure that requirement statements are in terms of system/ equivalent performance related to operational needs rather than dictating specific solutions.
- c. Provide an overall specification system that marries the current military specification and the type of specification defined by MIL-STD-490.
- d. Provide the rationale for the requirement statements contained in specifications/standards.
- e. Provide guidance to the user for selective application of the requirements.
- f. Provide a depository for lessons learned in each technical area.

#### IV. The New Specifications

Are they new? No! But rather taking the best parts of a variety of specification systems from both government and industry and putting them into logical, single structure.

In developing new weapon systems, our military services are facing sharply rising costs from two directions. The first is due to the highly sophisticated equipment required on the modern battlefield and the maintenance of that equipment. The second cost driver is not very visible; it's the way we write and use our specification in a world of advancing technology.

We live in a rapidly changing environment and we need documentation that is adaptable to change. Our current specification systems is not adaptable to rapid change. Consequently, it has come under repetitive attack as a major cost driver. However, every group investigating the system has generally come to the same conclusion. It is a required system, but fine tuning and slow improvements will not meet our future needs.

In various aircraft prototyping programs, ASD has found giving contractors maximum flexibility and minimum supervision has resulted in technical successes. We must apply this flexibility to all weapon systems programs. To accomplish this, we have developed a new series of documents called the Primary Specification, Standard, and Handbook.



## V. The Primary Concepts

This concept is aimed at new types of specifications, standards, and handbooks. These new documents are written for the contractor and for the government to provide guidance and set the framework to build specifications for product development as well as for the actual procurement cycle. The objectives of these new documents are to "force tailoring" and specify operational needs, and at the same time, improve other facets of the military specification program. This system will consist of three types of primary documents; specifications, standards, and handbooks. The primary specification (Mil-Prime) are aimed at specifying operational needs and general parameters for a physical product family with the specific values left blank. The primary standard (Mil-Prime-Std) provides the criteria and qualities applicable to a physical product but is not used to procure any actual product, and in many cases is very similar to our standards of today. The primary handbook (Mil-Prime-Handbook) contains technical rationale for the requirements stated in each primary specification and standard, provides guidance for applying the specifications and standards, and is a depository for lessons learned in each technical area. We would not develop a primary document for each individual product or service; this would just duplicate the 44,000 military specifications and standards in today's system. Instead, a broad family grouping will be established. These Mil-Prime product families will cover such areas as airborne radios, fasteners, parachutes, landing gear, or the entire aircraft structure.

The prime standards basically encompass the "-ilities" (reliability, maintainability, etc) as well as "standard test methods" or "climatic extremes." The handbooks will explain where a requirement came from and why we require it for both the specifications and standards.

These "Mil-Prime" documents, with the operational values blank will force tailoring. They also provide a depository for "corporate memory" and will allow others to question our requirements based on facts. No longer can anyone say "you must do it this way because the specification says so," and so the argument ends. Now the argument must rotate about the rationale contained in the handbook ... a logical point of departure. As new lessons are learned and technology changes, the handbooks will be updated.

As the specification is used, the blanks are filled in by the project engineer. The handbook assists in this filling-in process by showing how to fill in the blanks and, most importantly, the rationale for the requirements.

Of course, these documents are not just blanks. A closer look at the primary specification would show not only blank operational needs, but in addition, a section on interface would be provided. The project engineer would provide detail interface requirements such as a size of a bay, a coupler's part number, even available power and type, or details on government furnished equipment. In the technical community, we have standardized values, such as safety factors. These would be maintained within the document, but again with the back-up rationale in the handbook.

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In developing this concept, it was found that in some cases requirements within specifications could not be logically verified. In prime documents, any requirement must be verified by a corresponding verification, whether it be a test, analysis, or inspection.

Two other typical problems are trying to find the right person to ask a question on a specification; and second, finding the individual accountable for these documents. In the present system, they are "anonymous." A new facet will be the inclusion of name, address, and phone number of the individual responsible for the document, keeping it up to date, in a manner similar to the crew chief who has his name printed on the side of an aircraft.

While we have described the specifications, standards follow the same basic format; the difference being that the "standard values" appear in the document and that we are not procuring an item of hardware. In writing the primary specification, we envision only the standards as being referenced.

In practice (sic: Fig 3) the primary specification is a guide that the project engineer must now tailor. He must examine the blanks, fill in the applicable operational needs based on user input, provide interface requirements, and tailor the test section to the mission needs. The document has been designated a Type I specification, and it is a development specification stating the performance requirement for design or engineering development in terms of the operational needs. The Type I specification becomes part of the Request for Proposal. The government evaluates the contractors' proposals against this document and issues a contract. The item is then developed and after it has been found acceptable, either the contractor or government would prepare a Type II specification. This is a product specification stating detail design requirements for procurement of a product in terms of specific design needs, basically what today is a military specification. It may even be possible that from one Type I specification a series of Type IIs would evolve, such as for new components that were developed as part of this effort. Today, too often we directly write the military specification (Type II). This is almost like having the answer before the question is asked.

This is not really new but is an adoption of a technique that has been very successfully used in development/reprocurement of component items, such as microcircuits and switches within today's specification system. For some component series, a general design specification exists and in a manner they contain blanks. The blanks are stated by the term "as specified." A development document is provided by the procuring agency which states the "as specifieds." After development, a final detail specification is issued for reprocurement. The primary specification is similar to the general design document and the Type II is the same as the detail specification. One improvement is the Type I specification, which now would provide a standard bridge from the start to the final document missing in today's procurement method.

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At first, this appears to increase the number of specifications and it may if we were to view the military specification system only. In reality, there are additional specification systems within the Department of Defense. In many cases today, rather than use a specification, an exhibit of MIL-STD-490 specification is prepared. A major problem exists in the 490 system. In many cases, the hardware documentation that is developed is not available to outside activities; and as a result, standardization efforts take a second seat.

With the development of a prime document in each technical area, exhibits or MIL-STD-490 documents will no longer be required. Figure 4 shows the relationship of the current specification systems to the prime system. This will result in using one baseline; the prime specifications rather than the various documentation systems in use today.

One thing this program accomplishes is to raise the level of the specification to a higher level in the procurement tree. We have been too concerned with nuts and bolts and individual items such as particular radios and radar units. The Primary Concept allows us to move up to entire functional areas such as an aircraft structure, offensive avionics, or even to categories such as automatic test equipment and simulators. Within the Department of Defense, this method has been very successfully utilized at the component level. For higher order procurements, this same concept can be used. These are the areas the Air Force program is attacking. With experience, it may even be possible to view whole systems such as the air vehicle or support equipment.

This new concept also offers the Department of Defense with an opportunity to develop a new numbering system for specifications. Today's system is based on allocation of numbers to branches and assignment thereafter in numerical order. This does not facilitate data retrieval or provide a convenient method method to trace down products to avoid duplication. One suggested approach has been that each approach has been that each primary specification area be assigned a number. The handbook would have the same number. The Type I and Type II specifications would be issued an additional number to the basic prime number such as a dash number. In areas where the primary document covers a broad technology, additional coding may be necessary. The end objective is to provide a numbering system that would allow easy examination of all products already available within DOD that have been developed within any one class. When we combine this new numbering system with all types of specifications in one system, we also move forward in achieving another important goal standardization. This is accomplished by putting at the designers' fingertips what is available in a logical order not only what is in the current system, but also the MIL-STD-490 specification that today would have been left out. For example, let us assume we want to use a blind rivet on an aircraft. The primary area would be fasteners, and we would have additional coding for bolts, nuts, screws, rivets, etc. The end number is shown in Figure 5.

On the whole, the number of development specifications will decrease and the number of detail specification will remain the same. But we will know where things are, and what has been developed with DOD. This in itself will be a vast improvement.



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In viewing the standardization we must remember that the amount of standardization is a management decision. The specification and standards only serve as a catalog of what is available. Utilization of the new numbering system will improve standardization by providing a better picture of what is available.

At this point, we have discussed the Primary Concept and what it does accomplish. The movement of operational needs will allow different contractors to bid different solutions to a particular problem rather than solving the mechanics of single solution as described in so many of today's specifications. The end result will be a better product more responsible to the user's needs. It will encourage innovative design and, at the same time, reduce gold plating, because so many of the "cover your \_\_\_\_\_" (filling the blank) documents will no longer be thrown on the stack of specifications. Another point in this area is the forced tailoring which will contribute very strongly to meeting these objectives. The concept of broad primary documents will have an effect of reducing tiering or references from one document to another. This will contribute cost savings in the long term as well as a reduction in paper work. It also removes problems where one referenced document conflicts with another referenced document.

One document that has lingered in the background of this discussion is the handbook. Not much has been said other than it will provide the rationale and instructions for the specifications and standards. If we examine this new document carefully, we can find that it is one of the most most important aspects of this program. Today, we do not have a true depository in each technical area to retain our lessons learned. These handbooks would fulfill this need. In viewing the rationale behind requirements and criteria, these may change when conditions or state-of-the art progresses. Today, changes to criteria can be very difficult to effect when you do not know why a factor was established 30 years ago. It will also open up our rationale to the public for our requirements, adding an important check and balance that is missing today. It will allow us to apply the lessons learned from one weapon system to another since we are using the "same specification." Only the blanks change and give us the same baseline for different programs.

How does the government engineer fit in? First, for each primary document, there will be known focal points. We project him to be a busy man maintaining the handbook for his specification or standard. In the real world, we foresee very little change to the specification or standard; but constant change to the handbook. The engineer with the procurement team will be required to fill in the blanks and prepare the Type I specification. This is a prelude to an extremely hard task, that of source selection. Determining if a proposed solution can be accomplished as stated and its potential for success will not be a simple task and will require the highest degree of professionalism on the part of the government, the operational test program will provide the engineer with another challenge.

How does this affect the contractor? He now has latitude to truly design a solution within his area of expertise. But on the other side of the coin, he must now take a total systems approach. The handbook gives him a baseline to depart from. In meeting the needs of the Air Force, his responsibility has vastly increased.

Is this concept a dream? No! The Aeronautical Systems Division's (ASD) Deputy for Engineering, under the direction of the Air Force Systems Command and Headquarters, United States Air Force, is already moving into this program with an impressive set of primary specifications being prepared. These include electronic countermeasures equipment, landing gear, parachutes, and airframe structures. Some of these documents are going to take almost two years to develop. This is not an easy task. When the program will be finished in 1981-82 time frame, ASD will have less than 100 documents. The Department of Defense (DOD) is viewing this effort to determine if it can be applied to all DOD agencies. Success at ASD may result in change throughout the entire military establishment.

While these new documents are being prepared, the overall philosophy is being used in development of current system specifications. The F-16 and YC-14/YC-15 aircraft are using this concept in their procurement. Further, many individual equipment items will be procured in this manner. Initial findings in use of this concept to the CX-1 program (YC-14/YC-15) show significant improvements in its use. In the case of this program, both contractors have found savings in being able to respond to an operational need. For example, the RFP does not have a fastener specification, but rather views the aircraft mission. Both contractors have approached the fastener design from a different standpoint; and in both cases, the cost savings were in the range of the cost of one aircraft in this program.

Both contractors have indicated that the procurement and specification methods used in this program have saved \$50-75 million (actual data not releasable as program is still under source selection).

## VI. Summary

Over the past years, the Department of Defense has tried many different techniques. It seems that many of these techniques have not resolved our procurement problems. A major contributor to these problems has been the application of specifications. The specifications have been a common denominator over the years and possibly these documents have been the problem.

The Mil-Prime program in combination with A-109 offers an opportunity to provide a meaningful procurement system. We have also found the tailoring philosophy of the Mil-Prime concepts has flowed to data items and management plans in their use on a particular program.

The Mil-Prime Program is new, and ASD's testing of the new system will result in fine tuning over the next few years. Results so far indicate this is a viable approach to vastly improve our procurement of new systems.

DOD ILLUSTRATION

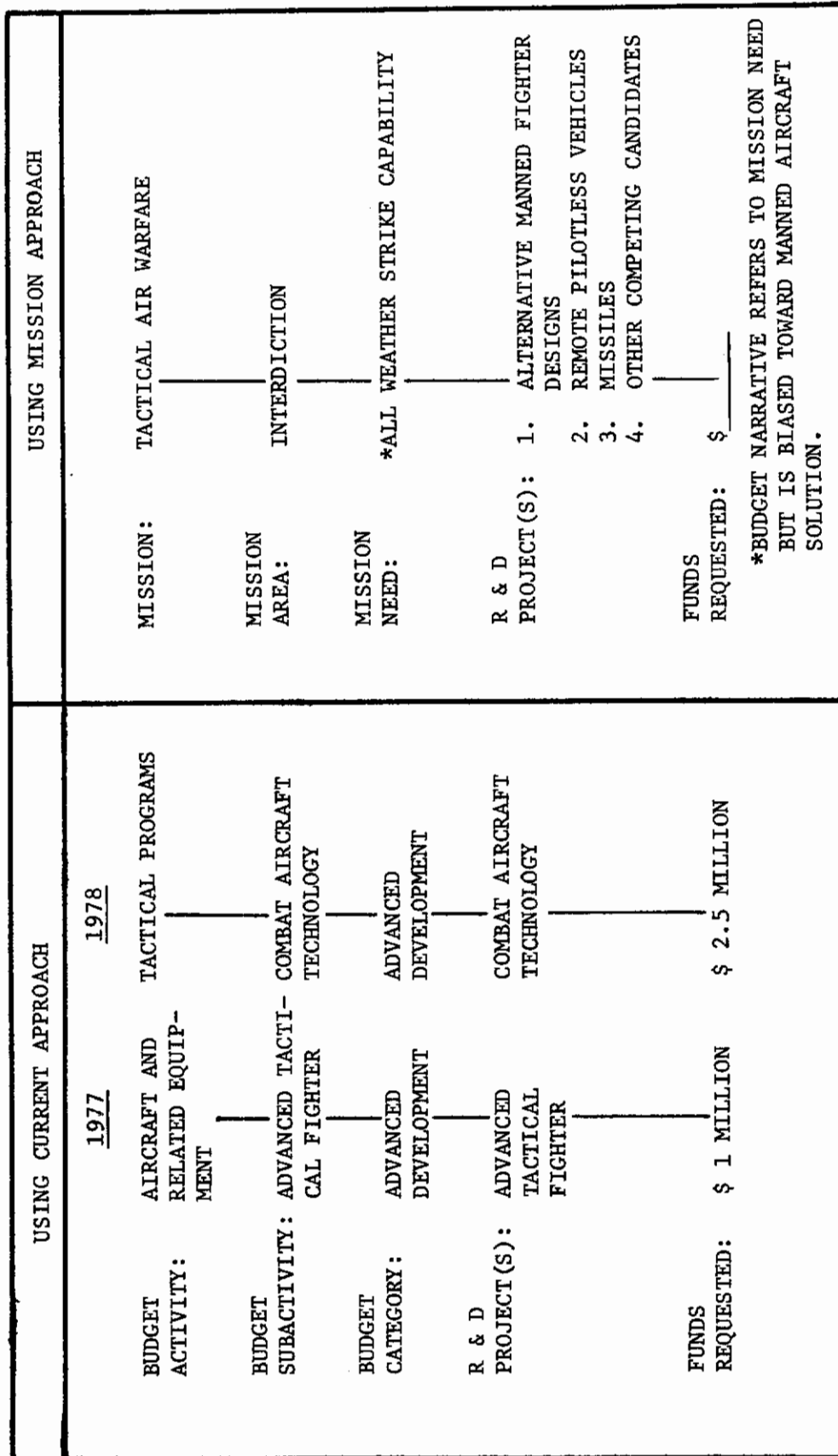


FIGURE 1

## VII. References

1. Office of Management and Budget, Circular No. A-109, "Major System Acquisitions." Washington, D.C. 1976, 12pp.
2. Office of Federal Procurement Policy, Pamphlet No. 1, "Major System Acquisitions." Washington, D.C. 1976, 36pp.
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4. Quigley, D. L. and Reel, R. E., "Comparison of Military and Commercial Design-to-Cost Aircraft Procurement and Operational Support Practices." AFFDL-TR-75-64, July 1975, 213pp.
5. Borklund, C. W., "Mission Budgeting and A-109: Procurement is Headed for a Shape-up." Government Executive, September 1977, pp. 12-21.



A MISSION APPROACH

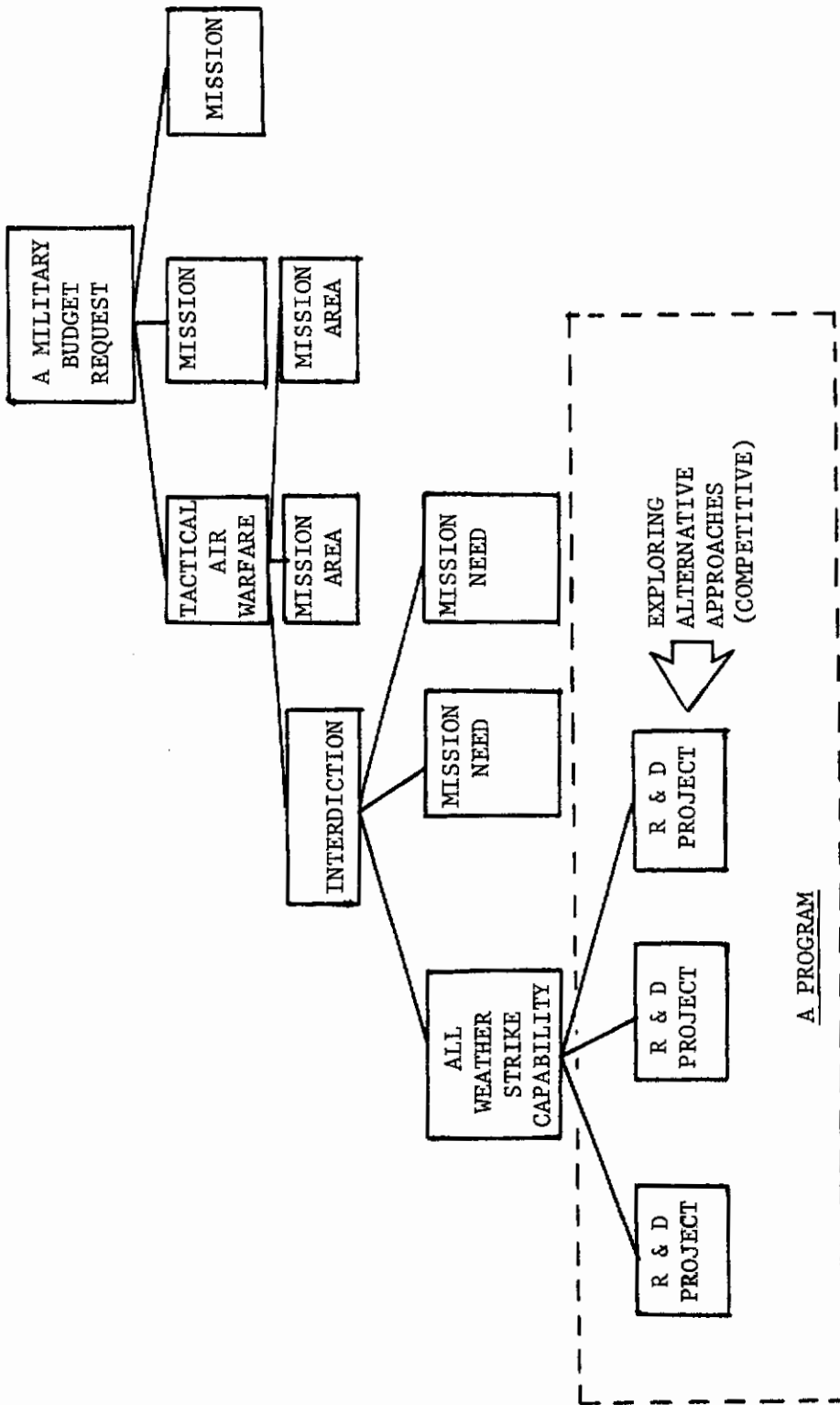


FIGURE 2

DOCUMENTATION FORMAT

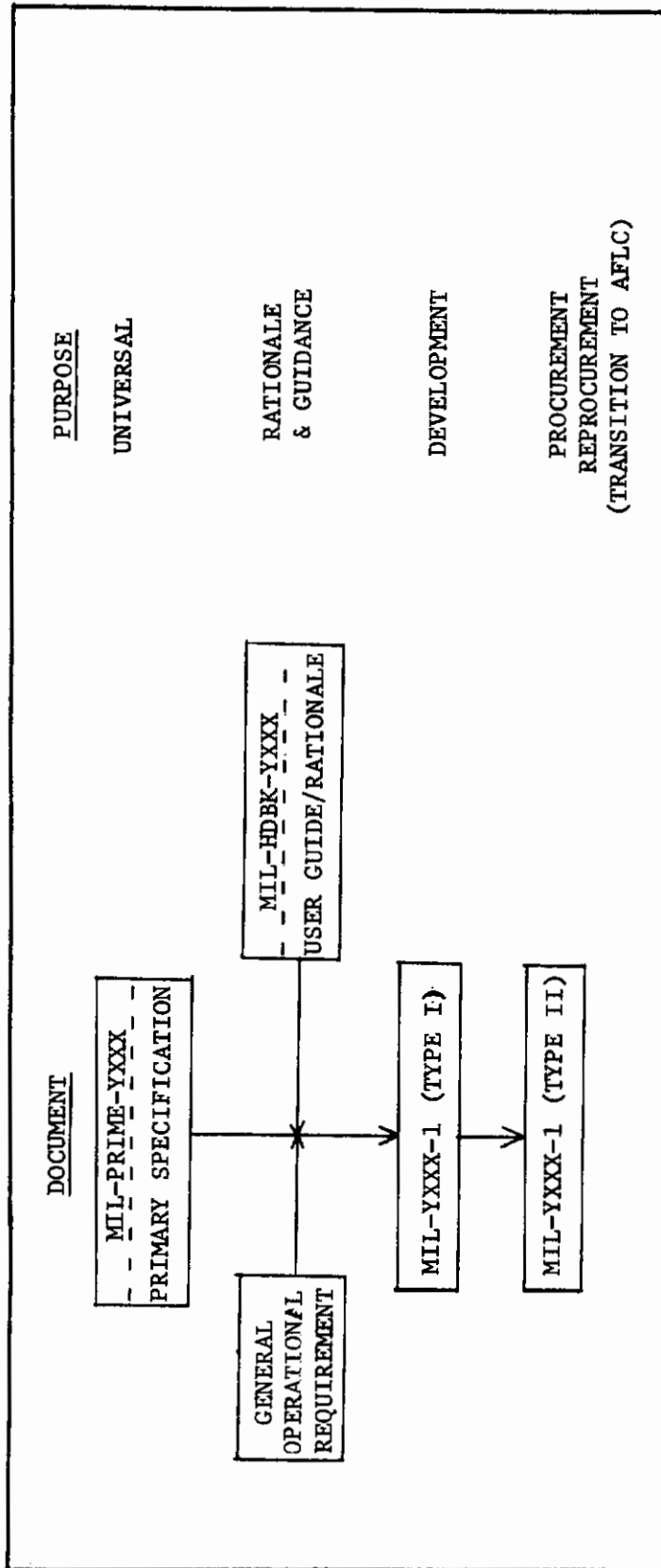


FIGURE 3

SPECIFICATION/STANDARD PERSPECTIVE

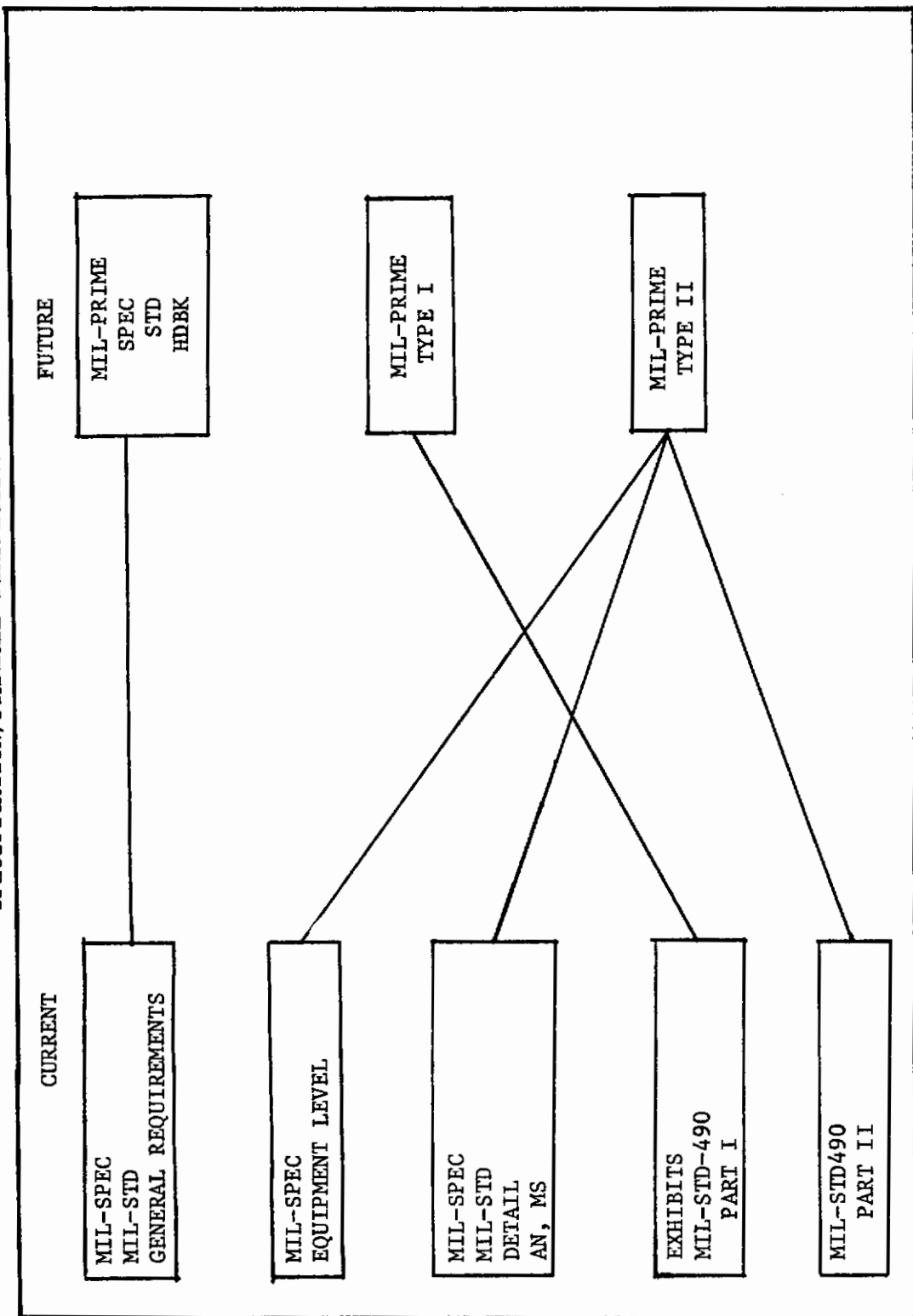


FIGURE 4

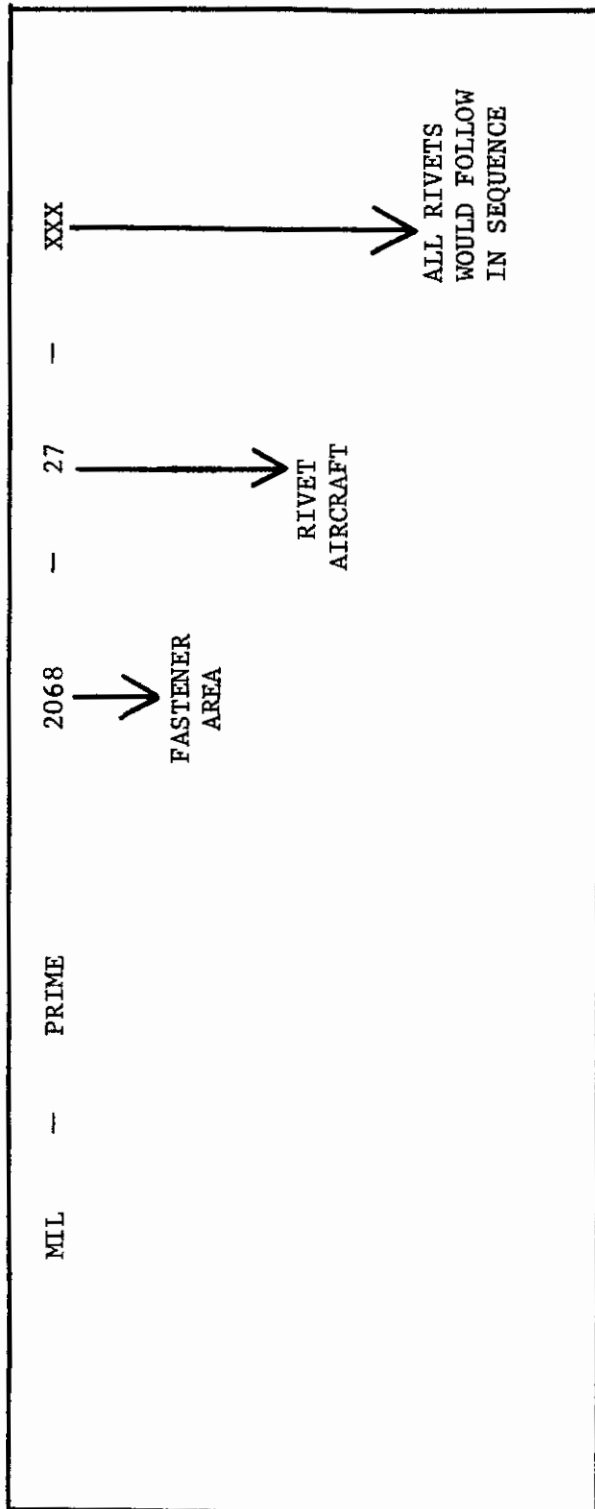


FIGURE 5