ESD-TR-67-230

AFSCM 375-1 IN RETROSPECT

C. J. Bashaw
C. E. Gardella

March 1967

TECHNICAL REQUIREMENTS AND STANDARDS OFFICE
ELECTRONIC SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
L. G. Hanscom Field, Bedford, Massachusetts

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FOREWORD

The management of technical requirements which define systems, system equipment, or individual equipments and changes thereto is termed "Configuration Management." Within the Electronic Systems Division (ESD), the Staff Office specifically charged with the responsibility for implementation of Configuration Management and AFSCM 375-1 is the Technical Requirements and Standards Office (EST). Effective utilization of the Configuration Management Manual has required development of supplemental policy and guidance at ESD. This report is a result of experiences derived from application of AFSCM 375-1, Configuration Management During Definition and Acquisition Phases, dated 1 June 1964, on programs assigned to ESD.

REVIEW AND APPROVAL

This Technical Report has been reviewed and is approved.

FRANK E. BRANDEBERRY, Colonel, USAF
Chief, Tech Rqmts & Stds Office

ABSTRACT

Application of Configuration Management Exhibits on ESD Programs has indicated that the terminology contained within them can be subject to interpretation. This report identifies problem areas that required clarification and workable approaches taken that were considered to be in accordance with the intent of AFSCM 375-1.

CONTENTS

SECTION I

INTRODUCTION

Configuration Management is defined as the management of technical requirements which define systems, system equipment, or individual equipment and changes thereto. It is implemented through procedures by which uniform and mutually supporting methods for configuration identification, control, and accounting are established and maintained for systems and equipment and for components of systems and equipment. AFSCM 375-1, Configuration Management During Definition and Acquisition Phases, establishes the technique of baseline management. Three baselines which serve as engineering reference points, i.e., Program Requirements, Design Requirements, and Product Configuration Baselines, are defined in terms of specification formats.

The relationship between Configuration Management requirements for uniform specifications, identification, control, and accounting, and the various exhibits of AFSCM 375-1 is as follows:

Requirements	Exhibit(s) Application
Uniform Specifications	I, II, III, IV, V, VI
Configuration Control	VIII, VII, IX
Configuration Identification	X, XI, XII, XIII
Reviews, Inspections, Demonstrations	XIV
Configuration Accounting	XV, XVI, XVII, XVIII

Application of the above Configuration Management Exhibits on ESD Programs has revealed some difficulties in their interpretation. Succeeding sections of this report indicate problems encountered and the policy and guidance offered which was considered to be workable and in accordance with the intent of AFSCM 375-1.

SECTION II

SYSTEM SPECIFICATION

The present AFSCM 375-1 concept of uniform specifications creates difficulties in application of Exhibit I on those ESD Systems which are incremental and evolutionary in nature. Two problems exist. The first problem concerns system elements and the second problem concerns system segments. Regarding system elements, the situation arises where several major integrated portions of a system with unique performance requirements exist but which are never contracted for as a separate entity (e.g., Joint Task Force/Joint Operating Center). Therefore, these system elements cannot be considered as segments under the present AFSCM 375-1 concept. Yet a means for documentation traceability is required. Regarding the second problem, it is often desirable to contract on a system segment basis without placing the entire system specification on contract. There are several reasons for this, among which are:

a. It is not always desirable to reveal the total scope of the task to a system segment contractor.

b. System analysis requirements are continuously performed and the system specification for evolutionary systems changes with continual addition of incremental segments.

The present AFSCM 375-1 manual does not provide a vehicle with which to contract on a segment basis as segments become identified without placing the entire system specification on contract.

In order to alleviate these two problems and comply with the intent of AFSCM 375-1, the following concept was developed:

a. Structure the system specification into volumes. One volume to contain overall system requirements and other separate volumes corresponding to each system element. System elements to be listed in Volume 1 of the General System Specification.

b. Volume 2, etc., to also be prepared to the format of AFSCM 375-1, Exhibit I, but to reflect system element unique requirements and indicate the segments of the system element.

c. The cover sheet for system elements to be as follows:

Performance and Design Requirements For The
XXXX System

Volume 2

XXXX System Element

d. Preparation of segment specifications in accordance with AFSCM 375-1, Exhibit I, to be used for contracting purposes. End items peculiar to the segment to be listed in the segment specification. The title page of the segment specification to read:

Performance and Design Requirements For The
(Name Segment) Name System

e. Preparation of contract end item (CEI) specifications in lieu of segment specifications in those instances where contracting is on an end item basis. Such end items to be listed as segments of the system element to which they pertain.

A need often exists to demonstrate that the performance level of a system is equivalent to the performance of the same or similar systems established by the Category II test program, without the extensive expenditures of resources required of the original Category II test effort. This testing may result from reprocurement and installation of a similar system (which might be furnished as AGE to another system), the spatial relocation of the original system (for test or logistic purposes), or in a multiple fixed site procurement wherein the Category II "system" test configuration requires only one or more of these independent sites, with deployment and activation of the remaining sites. Although it is still necessary to insure compliance with the system specification performance requirements, it is not economically justifiable to repeat the entire Category II test effort in these cases. An approximate parallel can be drawn at the CEI level between the relative complexity of the test effort required to comply with Section 4 of the Part I Specification (i.e., qualification) and Section 4 of the Part II Specification (i.e., acceptance). The same level of effort should be obtained at the system level between system Category II and system acceptance tests.

This situation can be alleviated by including in Section 4 of Exhibit I provision for establishing demonstration/acceptance requirements at a system level. These measures would be identified during Contract Definition and verified during the normal Category II development test program for subsequent use. They would comprise the minimum tests necessary to demonstrate acceptable system performance in the most economical and expeditious manner and at the grossest level feasible, i.e., one test which might demonstrate several requirements or a "quick" test which would yield the approximate results of an elaborate Category II test. The following new section can be included in Exhibit I:

Section 4.3, System Technical Demonstration/Acceptance Tests. This section shall specify the minimum system demonstration/acceptance test requirements which verify that a system which is essentially configured like the Category II system tested can perform to an equivalent performance level verified during Category II, without (necessarily) repeating all of the Category II tests in kind, number, or scope. Generally, the test requirements

will be selected from Sections 3.1.1 and 3.1.3 during Contract Definition and the method of verification will be subsequently validated during the development test program, to the satisfaction of the procuring agency.

> NOTE: The procuring activity reserves the right to require contractual compliance with any or all performance requirements included in Sections 3.1.1 and 3.1.3 if it deems necessary or desirable.

Requirements specified herein shall be specified to the level of detail which:

a. Permits ready identification of each selected verification requirement in Section 4.3 with the selected performance requirement in Section 3.

b. Specifies a verification requirement and method or alternate method to that specified in Section 4.2 for verifying the associated performance requirement in Sections 3.1.1 and 3.1.3. Methods of verification may include demonstrations, test, and evaluation of test data.

c. Specifies each requirement for verification to the level of detail necessary to establish the scope and accuracy of the test method.

AFSCM 375-1 presently anticipates that the System Program Office (SPO), possibly with the help of a not-for-profit organization, will prepare Sections 3.1 and 3.2 of the system specification during Phase 1A, and industrial contractors will prepare Section 3.3 during Phase 1B. Consideration should be given to requiring that the Using Command, rather than the SPO, prepare at least selected portions of Section 3.1 during or before Phase 1A. It is also advantageous to have other commands such as AFLC and ATC prepare those sections of the system specification that apply directly to them. Furthermore, Exhibit I does not provide adequate coverage of intersystem interface requirements. Subparagraphs are allocated in Section 3.3 to cover intrasystem interfaces, but this was not considered to be an appropriate place to discuss performance requirements involving the interactions between several separate systems. This problem was solved for the BUIC III System Specification by adding a new Section 3.1.1.4, to present functional and technical interface requirements between BUIC III and some 20-odd other systems.

SECTION III

CONTRACT END ITEM SPECIFICATIONS

Some problems in interpretation and application were also experienced regarding contract end item (CEI) specifications and contract end items (CEI's). Initial thinking was obscure regarding whether or not a CEI could be more than one single "black box" and the permissibility of having a "CEI within a CEI." The selection of CEI's, a joint determination between SPO and contractor, requires careful consideration.

On one program, CEI specifications were defined to the "black box" level to assure reprocurement control of the "black boxes." This was considered necessary since the system would be placed in operation in an R&D environment and many of the "black boxes" would be subject to removal, replacement, and improvement modifications. Although the basic objective was achieved, the Project Office was faced with serious problems in the Acquisition Phase.

Initially, there were 115 separate CEI's, primarily classed as prime equipment (CP) with only a few classed as identification items (CD). This meant 115 CEI specifications had to be reviewed, correlated, updated, corrected, and approved. Still further, the Project Office was committed to Preliminary Design Reviews (PDR's), Critical Design Reviews (CDR's), and First Article Configuration Inspections (FACI's) for each prime equipment (CP) item! The vast amount of both formal and informal documents created a huge paperwork burden for the Project Office's limited staff. The contractor experienced a considerable burden in the formulation of Category I test plans and procedures for each of the CEI's and the Project Office, in turn, experienced a tremendous problem in expediting a thorough review of the test plans and procedures.

This situation was alleviated somewhat by identifying a "design package" as a CEI. Although the "design package" itself consisted of other separately packaged CEI's, it was treated as a single entity and a common reference for program management. A CEI specification could then be written on the "design package."

The relative size and number of CEI's selected for engineering management purposes is important because a PDR, CDR, and FACI is normally required for each CEI. A small number of CEI's tends to make the management and conduct of these reviews unnecessarily complex and unwieldy whereas a large number of CEI's tends to create confusion and redundancy in the qualification test program (particularly in identifying CEI Category II test requirements) and increases the amount of work associated with the acceptance process.

Also, it is well to point out that the relationship between CEI specifications and technical manuals to be delivered has at times been misinterpreted. Technical manuals are prepared in accordance with the Contract Data Requirements

List (CDRL) and/or a procuring agency approved (updated) technical manual publications plan or other contractual requirement. Therefore, it is erroneous to assume any direct correlation between technical manuals to be delivered and CEI specifications.

An identification specification (CD) is normally prepared in accordance with Exhibit IV of AFSCM 375-1 for less complex CEI's that are used to support prime equipment CEI's. Qualification of such items, considered off-the-shelf, normally consists of simple inspection and demonstration. However, there are times when an off-the-shelf item can perform a critical function and be rather complex as well (e.g., magnetic drum). Consequently, the SPO desires to exercise close management control over the item. Questions were initially raised as to whether an identification specification was the only type specification that could be written for off-the-shelf items. A critical component specification (Exhibit VI) can be prepared even though the item is off-the-shelf. By so doing, close management control can be obtained because critical component specifications, Part II, are not formally approved until the CEI in which the component is installed has been qualified.

Design and development for a given CEI begins at the start of the Acquisition Phase. The uniform specification program is based on the concept of prior approval of specifications, or portions thereof. These approved portions are used for contract control of design and development in addition to being delivered as a product of the program. In many instances, programs that undergo Contract Definition as well as equipment programs are not always completely defined and specified prior to entering the Acquisition Phase. Consequently, there are times when Part I CEI Specifications may or may not be generated or if generated, may not be approved by the SPO.

This situation results in either the Design Requirements Baseline not being established or being established but not approved by the procuring agency at the time the Acquisition Phase is initiated. In such instances, the Design Requirements Baseline must be established as soon as possible after contract award (preferably within 30 days). In any event formal acknowledgement by the procuring agency of Preliminary Design Review completion should not be given until establishment of the approved Design Requirements Baseline.

SECTION IV

IDENTIFICATION AND ACCOUNTING

AFSCM 375-1, Exhibit XI, Paragraph 6.4.8, requires a system allocation document be prepared for system programs to identify the aggregation of CEI equipments and aerospace facilities which are the basis for system design and integration. This document, which is additionally used by Logistic Command and the Using Command for initial planning purposes, is comprised of two parts: Part I and Part II. It identifies the system configuration at each location and should be issued 30 days after formal approval of the Design Requirements Baseline. Experience has indicated that Part II of this document must contain as a minimum the following information:

a. CEI Specification Number.

b. Official Equipment Nomenclature.

c. CEI Quantity.

d. Assembly Top Drawing Number.

Lastly, questions have arisen concerning machine programs that are available to industry to accomplish configuration accounting when automated data processing techniques are used. For information and guidance purposes, it is well to point out that Systems Command has machine programs for both the IBM Model 7080 and Model 1410 Computers and that all Logistic Command Air Material Areas (AMA's) utilize the Model 7080 Computer. If approval is received from the procuring agency, these machine programs to accomplish configuration accounting are available to industry at no cost from Systems Command.

SECTION V

SUMMARY

The exhibits contained within AFSCM 375-1, dated 1 June 1964, have been extensively applied on programs assigned to ESD. Experience in application has revealed instances where the content of some exhibits has required further clarification. Instances where interpretation was required and the workable approaches taken which were considered to be in accordance with the intent of AFSCM 375-1 have been presented.

SECTION VI

REFERENCES

1. Air Force Regulation (AFR) 65-3, Configuration Management, 1 February 1962.

2. Air Force Systems Command Regulation (AFSCR) 57-2 and Air Force Logistic Command Regulation (AFLCR) 57-4, Configuration Management During Acquisition Phase, 10 December 1965.

3. AFSCM 375-1, Configuration Management During Definition and Acquisition Phases, Air Force Systems Command, U.S. Air Force, 1 June 1964.

4. AFSCM 375-4, System Program Management Procedures, Air Force Systems Command, U.S. Air Force, 31 May 1966.

5. AFSCM 375-5, Systems Engineering Management Procedures, Air Force Systems Command, U.S. Air Force, 10 March 1966.

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13. ABSTRACT

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